Pollution in Fish - Bioaccumulation

Grades

2-4

Subjects

Health and Science

Duration

20 minutes

Materials

Napkins or sheets of paper

Objective

Students will learn how toxins can bioaccumulate through the food chain.

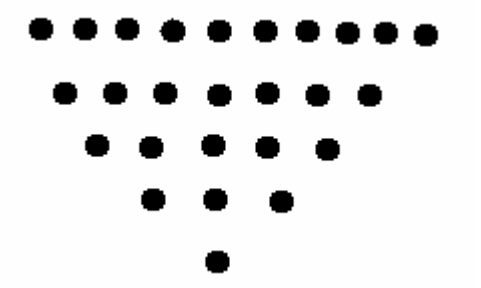
Students will understand the bioaccumulation of toxins in food can harm humans that consume the contaminated food.

Set

Introduce, or review the concept of the food chain/web.

Instructional Input

You will be using the class to actively demonstrate the mechanics of the food chain as well as the mechanics and effects of bioaccumulation.



Plant

Insect

Minnow

Trout

Human

Arrange the students in the above formation. The formation is based on a class of 26. Adjust the formation to suit your class size.

Place a sheet of paper or napkin on the head of each student in the front row ("plants"). Instruct the students in the row behind ("insects") to gently remove the paper from the heads of the students in front of them and place on their own head. This represents insects feeding on plants. Next, have the "minnows" feed on the "insects", and then the "trout" should feed on the "minnows." The human should feed on all of the trout, and should have accumulated all of the napkins.

Next, explain that the sheets of paper or napkins represent pollutants called dioxins. The dioxins made their way from a nearby source (a pulp and paper mill, waste and drinking water treatment plant, organic chemical manufacturer, municipal solid waste and industrial incinerator) into the sediment of the stream in which the plants live. The dioxins entered the plants from the sediment. When the insects ate the dioxin contaminated plants, the dioxin entered and stayed in their bodies. When the minnows ate the insects, they also accumulated the dioxins present in the insects. When the trout ate the minnows, the dioxins concentrated in the minnows were transferred to the trout. When the trout were consumed by the human, the entire load of dioxins from all the plants that served as the food for the insects, which fed the minnows, which fed the trout were transferred to the humans.

This phenomenon is called bioaccumulation. If each plant contained only one unit of dioxin, then the amount of dioxin that the human ingested was 10 units (1 unit for each of the primary producers that were consumed by all the organisms below the human on the food chain). Point out that even small amounts of pollution in the environment can be concentrated into amounts that are harmful to humans due to bioaccumulation.

Resources

The Agency for Toxic Substances and Disease Registry (ATSDR) has a public health statement fact sheet for Dioxins which can be obtained at http://www.atsdr.cdc.gov/tfacts104.html .

Closure

Using the ATSDR fact sheet on dioxins, point out the sources of dioxin pollution as well as the human health effects of dioxins to the class.